MEDICINE LAKE NATIONAL WILDLIFE REFUGE
NORTHEASTERN MONTANA WETLANDS DISTRICT
LAMESTEER NATIONAL WILDLIFE REFUGE

Medicine Lake, Montana

ANNUAL NARRATIVE REPORT

Calendar Year 1987

U.S. Department of the Interior
Fish and Wildlife Service
NATIONAL WILDLIFE REFUGE SYSTEM

REVIEWS AND APPROVALS

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E. A. Stroufe 4/8/88
Refuge Manager Date

Donald W. Schroeck 4/18/88
Zone Supervisor Review Date

Ralph F. Erickson 4/19/88
Regional Office Approval Date

INTRODUCTION

Medicine Lake National Wildlife Refuge

Medicine Lake National Wildlife Refuge is situated on the glaciated rolling plains in the far northeast corner of Montana. It is located in Sheridan and Roosevelt counties.

This refuge lies in the highly productive prairie pothole region and has relief typical of the glacial drift prairie; relatively gentle rolling plains with occasional shallow depressions. This is basically a prairie refuge located in the transition zone between the mixed grass and short grass prairie. Native brush species consisting primarily of chokecherry, buffaloberry and snowberry are common in coulees and sandhill areas. A few old shelterbelts still remain on the refuge and these trees appear to be out of place on the prairie, but are composed of a variety of introduced deciduous species.

The climate is typical of the northern Great Plains, with warm summers and cold winters, and marked variations in seasonal precipitation. Precipitation averages 12 to 15 inches per year. Temperatures can exceed 100 degrees in the summer and drop to -45 in the winter. Spring is generally the windiest period with velocities of 20 miles per hour that are associated with passing weather systems.

The refuge encompasses 31,457 acres which includes 13,546 acres of open water and marsh, 14,354 acres of grasslands and 3,557 acres of cultivated lands, primarily former croplands. Surrounding private ground is intensively farmed for small grain.

The refuge was established in 1935 by Presidential Executive Order with the primary purpose being to provide waterfowl production and migrational habitat.

In 1937, a Civilian Conservation Corps (CCC) set up camp on the refuge and 180 men began work. During the camp's four years of operation, many conservation projects were undertaken including dams, dikes, shelterbelts and fences. In addition, many of the refuge roads and buildings were constructed.

The 11,360 acre Medicine Lake Wilderness Area was established by Congress in 1976. This area includes the main water body of the lake and the islands within. Also included is the 2,320 acre Sandhills Unit with its unique rolling hills, native grass and brush species.

INTRODUCTION

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A. HIGHLIGHTS

Maintenance worker Carl Kampen retired during November. Seasonal Biological Technician, John Ensign, accepted a position with the Montana Department of Fish, Wildlife and Parks after three seasons at Medicine Lake (Section E).

Piping plovers (Threatened Species) experienced successful nesting on the refuge (Section G.2).

Waterfowl nesting studies revealed the highest success and nest density, for upland nesting dabblers, ever recorded for the refuge (Section G.3).

Avian botulism mortalities totaled nearly 6000 birds and an EHD outbreak killed numerous white-tailed deer (Section G.17).

Cedar shingles replaced old slate shingles on the office, student quarters and Quarters #1 (Section I.2).

The refuge entered the computer age (Section I.6).

The Lake Creek Flats cooperative marsh development project with Ducks Unlimited was completed (Section J.1).

B. CLIMATIC CONDITIONS

This corner of Montana went through another year without recharge into wetlands. January had only three inches of light snow, February added one inch of snow, and March only had 0.75 inches of precipitation. It was a brown winter.

May provided needed moisture for the uplands, but none of the moisture made it to wetlands. July again provided needed moisture for the crops and other upland vegetation, but except for the area bordering Canada in Daniels and Sheridan counties, little run-off occurred.

The 1987-88 winter is not making us optimistic about the chance of recharge into wetlands. The year's precipitation is about 2.5 inches below the average of 14.30.

Table 1. Temperatures and precipitation recorded at Medicine Lake NWR, 1987.

	High	Low	Precipitation
January	51(30)*	-15(15)	0.13
February	55(13)	3(26)	0.04
March	70(6)	5(9)	0.75
April	90(2 days)	24(2)	0.30
May	89(6 days)	35(3 days)	3.19
June	99(15)	41(3)	1.55
July	99(2 days)	41(2 days)	3.97
August	96(2 days)	41(6 days)	0.81
September	92(16)	33(19)	0.84
October	85(2 days)	15(24)	0.22
November	67(1)	8(29)	0.03
December	55(8)	-13(31)	Trace 7 times

*Dates occurred.

Medicine Lake was declared ice-free 11 April and official freeze-up was 20 November.

Figure 1. Locals say the wind blows in these parts. ML-87-14, exp #16, 10/87. TF

D. PLANNING

5. Research and Investigations

ML NR-82 - Northeast Montana Groundwater Study

This study was conducted from 1982-85 by the U. S. Geological Survey in cooperation with the Montana Bureau of Mines and Geology, U. S. Bureau of Indian Affairs, and the USFWS. The primary objective of the investigation was to describe the groundwater resources of the area including occurrence, recharge, movement, discharge, well yields, water level fluctuations, and water quality. The study area overlays the ancestral Missouri River valley from near Homestead to the North Dakota line. Medicine Lake NWR and nine WPA's are within the study area.

Our concern is withdrawal from this aquifer via irrigation by central pivot systems. Progress reports have been inconclusive and we are still awaiting a final report.

E. ADMINISTRATION

1. Personnel

1.	Eugene D. Stroops, Refuge Manager	GS-12	PFT
2.	Thad L. Fuller, Asst. Refuge Manager	GS-11	PFT
3.	Stephen J. Martin, Wildlife Biologist	GS-9	PFT
4.	Joan E. Quarne, Refuge Assistant	GS-5	PFT
5.	Kermit E. Bolstad, Automotive Mechanic	WG-10	PFT
6.	John E. Snellman, Maintenance Worker	WG-8	PFT
7.	Carl S. Kampen, Maintenance Worker Retired 3 November 1987	WG-7	PI
8.	Dennis C. Nelson, Motor Vehicle Operator 5-4-87 to 12-4-87	WG-6	PI
9.	John T. Ensign, Biological Technician 4-9-87 to 10-9-87	GS-7	Temp.
10.	Lyle L. Hancock, Range Technician 5-18-87 to 11-7-87	GS-4	Temp.
11.	Layne R. Krumwiede, Biological Aid 4-13-87 to 12-18-87	GS-4	Temp.

Number of Personnel

	Permanent			
	Full-time	Part-time	Temporary	Total FTE
FY-87	6	2	3	8.7
FY-86	6	2	3	8.6
FY-85	6	2	3	8.0
FY-84	6	2	1	7.4
FY-83	5	2	0	6.7

Carl Kampen retired in November. His easy going, friendly manner and sense of humor will be missed by all. Fortunately Carl lives in Medicine Lake and we are able to visit when he has time. The flash and shutter on the Pentax didn't jive; unfortunately we have no pictures of the retirement party.

The Service lost an excellent employee to the State of Montana. John Ensign was unable to acquire PFT status and left Medicine Lake Refuge on 9 October 1987 to accept a full-time position as a pheasant biologist with the Montana Department of Fish, Wildlife and Parks. Their gain is our loss.

Figure 2. One of the above is retired. Any guesses?
Standing: Jack, Dennis, Steve, Gene
Sitting: Kermit, Carl, Thad, Joan. ML-88-01, exp # 31, 1/88.

Figure 3. Hancock (left) and Krumwiede (right) were employed in the range aid positions funded under the emergency fire suppression subactivilty. ML-87-15, exp #22, 10/87.SM

2. Youth Programs

The Youth Conservation Corps program completed its sixth year of operation. The program started 22 June and ended 14 August. Enrollees were Rod Christensen, Darren Schmitz, and Malissa Stringer. All three are students at Medicine Lake High School.

Projects included waterfowl banding, botulism pick-up, nest searching, removal of old fence and building of new fences, scraping and painting buildings, removal of mower-damaging rocks along trails, maintenance of the recreation area, pruning trees in the shelterbelt by headquarters, lawn mowing, washing and cleaning vehicles, janitor duties in the office, hoeing and watering the nursery, hoeing shrub plantings on islands, and rehabing a routed wooden sign. They were a good crew.

Figure 4. L to R; Schmitz, Stringer, and Christensen. ML-87-7, exp #1, 7/87. SM

4. Volunteer Program

The refuge participated for the fifth year in the Student Conservation Association Program. Winter Smith from Virginia started 4 May and his appointment was extended to 2 September. Doug Pershun from Pennsylvania started 12 May and terminated 4 August. Troy Christensen from Arizona started 1 June and left 21 August.

The SCA's assisted with nest searches, waterfowl pair counts, colonial bird surveys, botulism cleanup, and duck banding. Winter Smith did a piping plover survey on the refuge and WMD. Doug Pershun assisted in the entry of nesting data into the computer.

Figure 5. L to R; Pershun, Christensen, and Smith. ML-87-7, exp # 7. 7/87. SM

5. Funding

Medicine Lake NWR and the Northeast Montana WMD have combined funding.

Table 2. Funding, 1983-87, MLNWR and NEMTWMD.

Activity	FY-83	FY-84	FY-85	FY-86	FY-87
1260	252,000	308,000	335,000	408,000	392,000
6860	8,000	8,000	8,000	8,000	7,000
8610	3,000	8,500	9,100	5,500	5,800
1520	9,000	7,000	7,000	7,500	---
1210	---	---	---	---	3,000
2821		66,000	38,200*	30,950*	23,215*
TOTAL	272,000	397,500	397,300	459,950	407,800
BLHP	121,260				

* These funds were carried over from the previous

6. Safety

Another year passed without a work-related accident. An inspection by the zone supervisor and his assistant revealed an inadequate safety plan. A new plan will be in place next year.

7. Technical Assistance

The refuge has been hosting a youth Hunter Education program since 1964. This year 11 students completed the course which included five evening sessions and a Saturday field day. Martin and Fuller presented the classroom portion and Bolstad set up and assisted during the field day. Wayne Stringer assisted during the field day and Bill Bakken presented material on firearms and ammunition. Both men are refuge neighbors.

Figure 6. The 1987 Hunter Safety class at field day.

8. Other Items

Revenue sharing checks were distributed to the three counties; Daniels - $291, Roosevelt - $3820, and Sheridan - $49687. Sheridan includes the refuge and WMD lands plus the lease and production monies from the two oil wells on the refuge.

9. Training

January

Martin: Ten fun-filled weeks at FLETC.

February

Fuller: Holistic resource management.

March

Stroops: Holistic resource management.

Stroops, Fuller & Martin: Law enforcement refresher.

June

Nelson, Snellman, Bolstad, Martin & Fuller: Session by BLM on FERS and CSRS retirement systems.

Martin: Wetland classification workshop.

July

Fuller: Leafy spurge symposium.

Office Staff: Introduction to computers.

August

Stroops and Fuller: Steel shot seminar.

October

Quarne: Administrative workshop.

Bolstad and Nelson: Pesticide training.

F. HABITAT MANAGEMENT

1. General

Spring growth got a good start and we were optimistic for an excellent upland cover producing year. We are so accustomed to a brown landscape that the green vegetation through August brought smiles to our faces. Things changed in the fall and we returned to normal (at least during the last six years) and our August seeded DNC and farmer's winter wheat fields are showing moisture stress.

2. Wetlands

The 1986-87 winter was the sixth consecutive year of snowpack being inadequate to recharge refuge impoundments. We entered the year with a deficit of 15,405 acre feet. Run-off from all sources was 9316 acre feet. We had some movement of water in the Big Muddy noted 3 February. The radial gates at Indian Service Dam were closed 6 February. Another thaw occurred in the latter part of March and we were moving water into the Homestead Unit this month. The first 10 days of April was the end of spring run-off and all pools were at management levels except for Pool #12, Homestead, and Katy's Lake. The late July rains reached the diversion control structure the first part of August (Fig 7).

Figure 7. The Big Muddy lives up to its name. ML-87-10, exp #4, 8/4/87. TF

We started to drawdown Homestead on 7 July for botulism control. We reduced the water levels from 1936.0 to 1933.5. We started releasing water from Medicine Lake to Homestead on 9 September. The water levels in Homestead increased to 1935.5 by mid-October.

The refuge water deficit at freeze-up was 17,628 acre feet.

Water chemistry is performed (Table 3) to document changes in water quality. Readings are taken during spring run-off and again after freeze-up.

Table 3. Comparison of fall water chemistry readings, 1982-86, and 1987, MLNWR.

		Salinity Parts/1000		Conductivity Micromhos/cm	
Impoundment	Location	1982-86	1987	1982-86	1987
M. Lake	1A	1.3	1.8	1380	1850
M. Lake	1B	1.1	1.7	1290	1810
Gaf. Lake	2A	1.8	3.0	1660	2200
Gaf. Lake	2B	1.5	2.2	1720	2490
#10 Lake	3	1.9	0.8	2042	510
Deep Lake	4	1.9	2.5	2125	2800
#12 Lake	5	1.7	2.0	1760	2120
Katy's Lake	6	7.2	11.0	6960	10300
#11 Lake	7	2.9	4.9	2840	4510
Homestead	8A	2.0	1.8	2039	1850
Homestead	8B	2.7	1.3	2751	1390
Sayer(1984-6)	9	2.2	---	2273	120

3. Forests

During April the following was planted in the headquarters nursery; 100 sandcherry, 100 golden currant, 100 juniper, 100 Nanking cherry, and 90 blue spruce. Four plots were established on Bruce's Island and 1180 Wood's rose and 230 snowberry seedlings were planted. These plots were checked again in August. Survival of the rose plants was 61% and snowberry was 55%. On Katy's Lake 1586 Wood's rose were added to previous years plantings (Fig 8).

4. Croplands

The cooperative farming program includes six permittees farming 635 acres (Table 4). These crops provide food for both migrant and resident species of wildlife. Yields were 30 bushels for winter wheat, 40 bushels for barley, and 30-35 bushels for spring wheat. The refuge's share is one-third when unharvested and if we require some form of harvest, our share is one-fourth. Our share of winter wheat crops was cut early and put in large, round bales. These were then moved to areas of winter concentrations of upland game birds (Fig 9).

Figure 8. Shrub plantings on Katy's Lake Island. JE

Figure 9. Winter wheat bale by Pool #12 structure. ML-88-01, exp 19. 1/88. SM

Table 4. Cooperative farming, 1987, MLNWR.

	Acres					
Permittee	Spring Wheat	Winter Wheat	Barley	Mech Fallow	Chem Fallow	FWS Share
Tronson	---	63	---	---	57	21
Ator	---	76	---	---	83	25
Schmitz	---	33	15	57	---	17
Nelson	45	---	---	45	---	15
Bolstad	---	47	---	---	31	12
Haase	38	23	---	22	---	15
TOTAL	83	242	15	124	171	105

The refuge seeded 90 acres to DNC using our Lilliston drills (Table 5). Pure, live seed mixture was intermediate wheatgrass-#8, pubescent wheatgrass - #2, alfalfa - #2, and sweetclover - #1.

Table 5. Force account DNC seeding, 1987, MLNWR.

Field	Acres	Seeding Dates	Seed Bed Preparation
N1/2SW35,T32,R56*	18	4/29	Mechanical fallow
#17	42	5/8	Chemical fallow
#18	30	5/29,6/1	Chemical fallow

*Reseeding of unsuccessful 1986 DNC seeding.

The field in the NE 1/4 of Section 8, north of #12 Lake, was mechanically fallowed this year. Approximately 50 acres of 1986 DNC seedings were swathed during May to reduce competition from Tansy mustard and allow sunlight to reach the DNC seedings.

5. Grasslands

Portions of the refuge contain dense clubmoss. An area northwest of Katy's Lake and south of #10 Lake were selected for experimental treatments using a "sheepsfoot" (Figure 10). Approximately five acre plots using one, two, and three passes were treated during the first week of May. The areas received about a half inch of rain three days prior to treatment.

We allowed a local farmer to harvest approximately 180 acres of tall and intermediate wheatgrass. During the last part of August he combined 3700 pounds. The refuge is to receive 60% of the cleaned and bagged seed.

Figure 10. Sheepsfoot treatment on clubmoss. ML-87-4. GS.

6. Other Habitats

This fall the borrow area by #11 Lake control structure was leveled and seeded to DNC. Sheridan County rehabed the Gravel Pit and the refuge seeded DNC in October.

7. Grazing

Seven permittees grazed five units from 15 May to 15 September (Table 6). This was the third year of a four pasture rest rotation system in Unit 14. Permittees were allowed to provide labor, materials, or both, for improvements on grazing units and thus reducing their grazing fee. The grazing fee for MLNWR was $6.40/AUM. The total grazing bill was $6689.92, but permittees reduced this by $2138 for their fencing labor.

Table 6. Grazing program, 1987, MLNWR.

Grazing Unit	Acres	AUM'S
7	449	120.4
8	2320	371.8
9	515	157.6
14	1150	334.6
15	636	60.9

10. Pest Control

The Big Muddy Creek drainage has widespread infestations of leafy spurge. This drainage is the main source of water for the refuge and the potential for spreading the dreaded weed into the refuge is high. Areas along the Diversion Canal and the Sheep Creek area of Homestead have been treated for the last seven years. Small patches in the Sandhills Unit have been treated for six years.

Table 7. Chemical application, 1987, MLNWR.

Location	Acres	Chemical	Habitat/Pest	Dates
Big Island	2.0	Tordon 2K	Leafy spurge	5/21,6/29
Gopher Point	0.1	Tordon 2K	Leafy spurge	5/11
Narrows	0.1	Tordon 2K	Leafy spurge	5/11
Sandhills	0.9	Tordon 2K	Leafy spurge	6/22,9/30
Homestead	0.1	Tordon 2K	Leafy spurge	9/30
Refuge	104.0	2,4D Amine	Canada thistle	July
Homestead & Diversion	6.8	2,4D Amine	Leafy spurge	5/19
Road sides	30.5	2,4D Amine	Kochia	6/26
Secondary headquarters	45.0	Landmaster	Cropland	4/30
Farm fields	171.0	Landmaster	Cropland	May
Farm fields	355.0	2,4D Amine	Cropland	May
Shrub plantings on Bruce's & Katy's Islands	0.3	Casoron	Weeds	11/13

Gopher Point and the Narrows are new areas for spurge control.

G. WILDLIFE

1. Wildlife Diversity

Wildlife diversity is maintained by management practices that are centered on waterfowl production and maintenance. Diverse plant communities ranging from xeric grasslands to mesic wetlands provide habitat characteristics essential to species that breed on the refuge and habitats that meet seasonal requirements for migrant species.

2. Endangered and/or Threatened Species

Whooping cranes were sighted three miles north of the refuge during spring migration. The birds were reported to the refuge on 23 April. Manager Stroops observed two adults and one juvenile for two hours until the birds took wing and flew

toward the northwest. The birds were first seen in the area on 22 April by a local farmer. A fall sighting was reported in the same general area but searches by refuge personnel failed to locate any birds.

Bald eagles were sighted on the refuge during January throughout April and October through December. Peak numbers occurred during December when two adults and one immature bird were sighted.

Peregrine falcon sightings on the refuge included four spring observations. One or more adult birds were sighted near Gaffney Lake on 21 April, on 26 April near Sayer Bay, in flight over Katy's Lake on the 27th and at Beaver Pond on the 28th. Spring sightings in 1987 included three more than in either 1985 or 1986 but the dates of sightings are remarkably similar, 26 and 30 April respectively.

Piping plovers, a threatened species, are known to nest on the refuge. Surveys to locate use areas and nesting sites have been conducted since 1986. The purpose of these surveys is to estimate the number of birds and to estimate annual production.

Piping plover surveys were conducted from May to July in areas where birds were sighted during previous years or areas suspected to have potential nesting habitat. Habitat considered to have potential for piping plovers consisted of beaches along lakes or wetlands that were sparsely vegetated and with substrates containing a mixture of small rocks, pebbles and sand.

Piping plovers were first sighted on 24 April with the observation of a single adult bird on Katy's Lake where a nest was located in 1986. The second sighting occurred on 29 April on a nesting beach along Tax Bay (Medicine Lake). The third sighting was on 7 May along the south side of Medicine Lake.

These three sightings were believed to be adult males that arrived prior to females to establish nesting territories. Paired birds were first seen on Katy's Lake on 15 May when two pairs were sighted. Additional pairs were first sighted on Tax Bay and the main lake on 5 and 15 May respectively.

Nesting was first documented on 19 May with the discovery of a nest (MDL87-01), with three eggs, on the Tax Bay site. The nest was revisited on 11 June and although the two adults were still territorial the nest contained no eggs. An additional visit on 20 June resulted in the location of a new nest (MDL87-07) with four eggs. On 12 July the site was checked and presumed to have successfully hatched. No young were sighted but feigning by the adults indicated that young were probably in the area. This nest was believed to be a renest of the

first unsuccessful nest. This nest site was active in 1985, successfully hatching three of four eggs and unsuccessful in 1986 with a clutch of four eggs. Approximately 100 yards of this beach are protected from livestock by an electric fence erected in 1986 (Figure 11).

Figure 11. Piping plover nesting beach protected by electric fence. Note the cattle tracks in the foreground. ML-87-9, exp #14. 5/22/87. SM

The second known nesting site occurred along the south side of Medicine Lake where the third plover sighting of the year occurred on 7 May. On 22 May a nest (MDL87-02) with three eggs was found. A recheck on 11 June revealed four eggs. This nest successfully hatched and all four young were observed on 23 June. This nesting beach was fenced with one-third miles of electric fence to protect the nest site from cattle trampling. A Gallagher fence charger, with a solar panel, was used to power the three-strand, braided plastic wire.

The only additional known successful nesting occurred on Bruce's Island, a 350 acre natural island in Medicine Lake. On 1 July a nest (MDL87-06) with two eggs was found. On 8 July the nest was empty but the feigning behavior of the adults indicated that young were nearby. A successful nest also hatched in this area in 1986.

Nesting on Katy's Lake was unsuccessful for the three nests found in 1987. The first nest (MDL87-03) was found on 12 June but on the 23rd the nest was empty. Two additional nests were found nearby, one of these (MDL87-05) was believed to be a re-nest and the other (MDL87-04) a first attempt by a second pair. Both of these nests were also unsuccessful.

Single plovers were sighted on areas where pairs nested in 1986, including the gravel pit site and north Tax Bay. A new sighting area in 1987 included the south shore of Medicine Lake, south of Big Island, where a pair of birds were sighted on 6 and 20 June. One bird was observed to lay in an apparent scrape but no other evidence of nesting was recorded.

When completed, a total of 40 man-hours were spent searching 26 miles of shoreline. The seven nests found, believed to represent five breeding pairs, eventually hatched six to ten young (Table 8). Non-breeding adults totaled at least two birds.

Table 8. Piping plover nests, location, number of eggs, fate and number of young observed, MLNWR, 1987.

Nest	Location	# Eggs	Fate	# Young
MDL87-01	MLNWR T31N, R57 NE 1/4 S8	3	U	0
MDL87-02	MLNWR T31N, R56E NE 1/4 S23	4	S	4
MDL87-03	MLNWR T32N, R58E SW 1/4 S17	2	U	0
MDL87-04	MLNWR T32N, R58E SW 1/4 S17	3	U	0
MDL87-05	MLNWR T32N, R58E SW 1/4 S17	2	U	0
MDL87-06	MLNWR T31N, R56E NE 1/4 S5	2	S	1-2
MDL87-07	MLNWR T31N, R57E NE 1/4 S8	4	S	1-4
TOTAL		20		6-10

S = Successful nest
U = Unsuccessful nest

3. Waterfowl

Canada geese first arrived on 5 February with the arrival of nine birds and were followed by mallards in early March. Numbers peaked at 1200 geese in mid-April and 10,000 mallards on 5 April. Other duck species that peaked in April included; 4,000 gadwall, 3,000 pintail, 4,000 northern shoveler, 1,000 wigeon and 4,000 lesser scaup. Blue-winged teal and redhead peaked during early June with 3,500 and 700 respectively.

Spring snow and white-fronted goose numbers were low in 1987. One-hundred snows were sighted in mid-April compared with a peak of 700 last year. One white-fronted goose was sighted this year compared to 25 in 1986. Eleven Ross' geese were sighted on 27 April on the Homestead Unit.

One flock of four tundra swans were sighted on 8 April.

Refuge duck production estimates relied on breeding pair counts from 1969-84. Since 1984 production has been determined by nesting studies and the use of Mayfield estimators to calculate nesting success and the resultant duck production.

Nest studies employ the use of cable chain drags on upland sites and foot searches of islands. During 1987 nest drags were conducted on four dense nesting cover (DNC) fields totaling 313 acres and on three native grassland (NGL) fields totaling 270 acres. Nest dragging was initated on 6 May and terminated on 15 June. Island searches were conducted during the same period on 11 islands.

A total of 501 nests were located during the nesting study (Table 9). Each nest located was monitored until its fate was determined resulting in nesting success and nest density for DNC and NGL. Island success was also determined but nesting densities were not calculated. Nesting success is calculated using the Modified Mayfield Method. All duck species were lumped together to determine nesting success because of small samples sizes for some species. Nest densities for each species were calculated even though sample sizes are sometimes small.

Table 9. Species composition of located duck nests by habitat, MLNWR, 1987.

SPECIES	DNC N	NGL N	UPLAND* N	ISLAND N	TOTAL N
Gadwall	112	27	139	31	170
Mallard	33	8	41	30	71
B.W.Teal	49	39	88	2	90
N.Pintail	33	9	42	12	54
N.Shoveler	33	27	60	5	65
Wigeon	5	1	6	3	9
L.Scaup	12	11	23	11	34
Redhead	0	0	0	7	7
Canvasback	0	0	0	1	1
TOTAL	277	122	399	102	501

*Upland nests include those in DNC and NGL.

Mayfield nest success was excellent in DNC and NGL with 59% and 73% respectively. Nesting success for these habitat types in 1986 was 46% and 42% respectively. Island success dropped from 74% in 1986 to 57% in 1987. Improved success on upland sites during 1987 is believed due to the low number of mammalian predators on the refuge (See G.15). Lowered island success is unexplained but may be related to the small sample size in 1987.

Nest densities in DNC and NGL increased dramatically in both upland types and were the highest ever recorded for the refuge (Table 10).

Table 10. Number of nests, Mayfield Success and densities in DNC and NGL, for 1974-76, 1981, 1985-87, on MLNWR.

	DNC			NGL		
	(N)	Mayfield(%)	Nest/Ac.	(N)	Mayfield(%)	Nest/Ac.
1974	6	70	.036	29	3	.018
1975	69	73	.416	100	27	.206
1976	33	60	.199	117	42	.241
1981	84	47	.364	50	42	.202
1985	99	34	.246	78	22	.226
1986	125	46	.287	137	43	.376
1987	277	59	.887	122	73	.452

Nest densities were also determined for each species by habitat and expanded to the entire refuge to estimate the total number of nests for each species in DNC and NGL. The number of nest were then multiplied by the Mayfield Success to determine the number of successful nests. The resultant number of successful nest (ie. number of broods) were then multiplied by a brood survival rate of 74% (provided by Northern Prairie Wildlife Research Center, NPWRC) and by a constant for the number of ducklings to flight stage (Pospahala et.al. 1974). The end result was an estimate of duck production for refuge upland habitats. Island production used the Mayfield Success estimate and a best guess of the number of nest located on islands based on the partial searches conducted.

Some species presented problems for production estimates. Overwater nesters, primarily redhead and canvasback, required best guess production estimates. Refuge duck production for 1987 is shown below.

Gadwall	5740
Blue-winged teal	4915
Northern shoveler	2990
Mallard	1632
Northern pintail	1290
American wigeon	360
Lesser scaup	2400
Redhead	670
Ruddy duck	260
Canvasback	80
TOTAL	**20,337**

The total duck production of 20,337 is slightly more than the 1986 figure of 19,630. Production estimates are believed greater than the figures indicate since previous estimates assumed a brood survival of 100% which was modified to 74% for 1987.

Canada goose production was estimated by an aerial nesting survey flown on 28 April. Estimates are based on the number of nest observed or pair activity that indicates nesting, plus a 15% visibility factor, times an average of four goslings per nest. Production estimates totaled 966 compared with 795 for 1986.

Artificial nesting structures, first placed on the refuge in 1985, continue to experience low use. Eight fiberglass tub structures examined after the nesting season revealed use on only three.

Fall duck numbers peaked during the first week in October with

24,750 birds, down from the peak of 30,000 in 1986.

Fall goose and swan numbers showed increase from last year for Canada's, white-fronts, and swans but snow goose numbers were down considerably (Table 11).

Table 11. Fall peak goose and swan numbers, MLNWR, 1987.

Year	Canada	Snow	White-front	Ross'	Tundra swan
1987	1500	300	1200		1000
1986	1200	3000	500		300
1985	1200	10	600		300
1984	800	550	500	3	350
1983	1200	15	1750		800
1982	1176	9	725		300

4. Marsh and Waterbirds

White pelicans nested at two locations in 1987. Big Island, a 247 acre natural island in Medicine Lake, continued to be the primary nesting area but nesting also occurred at Bridgerman Point, approximately one-half mile from the Big Island colony. Double crested cormorants returned in greater numbers this year and nested alongside pelicans at both locations. Both species showed major increases from 1986 with cormorants producing record numbers. Marsh and waterbird production estimates are shown in Table 12.

Table 12. Major marsh and waterbird production estimates, MLNWR, 1983-87.

Year	W.Pelican	D.C.Cormorant	G.B.Heron	W.Grebe	Eared Grebe
1987	2610	1220	77	475	600
1986	1100	85	27	450	375
1985	1800	435	25	250	600
1984	2600	400	60	250	600
1983	1500	260	90	250	400

Unusual sightings included a great egret sighted on 5 May and a white-faced ibis on 12 September.

5. Shorebirds, Gulls, Terns and Allied Species

Ring-billed and California gulls nest on three man-made and one natural island. Production estimates totaled 3000 and 4000 for ring-billed and California respectively.

Franklin's gull numbers peaked at nearly 50000 during spring and fall but nesting did not occur again this year. Nesting by this species has been limited to a single season, 1985, when 250 nests were found in #10 Lake.

Common terns nested on Bruce's and Gull Islands with 60 nests found. Production was estimated at 125.

Caspian terns nested on the refuge in 1985 but only one bird returned to the nest site, Gull Island, in 1986 and 1987.

A rare visitor to the refuge was a ruddy turnstone, sighted on 19 May along Overland's Point on the south shore of Medicine Lake.

The following species are known to nest on the refuge but efforts are not made to estimate numbers; American avocet, marbled godwit, willet, upland sandpiper, killdeer, spotted sandpiper, black tern, Forester's tern, Wilson's phalarope and common snipe.

6. Raptors

Raptors species nesting on the refuge this year included northern harrier, Swainson's hawk, great-horned owl, and short-eared owl.

Snowy owls were abundant during November and December. Owls were first sighted on 9 November and peaked with a minimum of 13 birds present on the refuge during the first week of December.

Other raptors sighted included; golden eagle, turkey vulture, prairie falcon, merlin, kestrel, sharpshinned and Cooper's hawk, and rough-legged and red-tailed hawks.

The National Wildlife Federation, Mid-Winter Bald Eagle Survey, was conducted on 9 January. Eagles sighted included four golden eagles.

7. Other Migratory Birds

Mourning dove nesting is limited on the refuge due to the shortage of trees. Refuge shelterbelts and CCC tree plantings provide the majority of available nesting habitat. Production was estimated at 100.

Figure 12. Snowy owl perched on kiosk. ML-87-11, exp # 7. 11/87. SM

8. Game Animals

The Montana Department of Fish, Wildlife and Parks conducts annual pre and post hunting season aerial surveys in two trend areas near the refuge. One area includes the refuge and the other the private sandhills that border the southeast boundary of the refuge. Post season, 1986 hunting season flights were flown 2 and 3 April. Results of that flight revealed the presence of 629 (8.5/square mile) and 538 (6.4/square mile) white-tailed deer for the private sandhills and refuge respectively.

Flights 6 and 7 October, prior to the 1987 hunting season, revealed 155 (2.1/square mile) and 333 (4/square mile) deer, representing reductions of 37% and 19% from 1986, for the private sandhills and refuge respectively. State biologists believe that the lowered number of deer in northeast Montana is a result of losses to EHD (see G.17) and possibly that deer were distributed over private lands with CRP fields attractive to deer.

Occasionally the refuge receives a visit from a member of the deer family that is not common to the prairie potholes. Mule deer, elk and moose have been sighted on the refuge during the last ten years but the arrival of a caribou on 26 August resulted in comments like "You saw a what? Where did you see this (snicker, snicker) this aah caribou?" The humor ended when the photograph in Figure 13 arrived. The animal, apparently a woodland caribou (Rangifer trandus) was first sighted 10 miles north of the refuge and eventually entered the western edge of the refuge immediately south of the town of Medicine Lake. The animal eventually left the refuge during the afternoon of 26 August and crossed Muddy Creek entering the Fort Peck Indian Reservation. According to state officials the animal was eventually killed by tribal members near Fort Kipp, along the Missouri River. State biologists believe the animal most likely migrated from Manitoba some 500-600 miles northeast of Medicine Lake.

Figure 13. A new member for the refuge mammal list! 8/26/87. JE

10. Other Resident Wildlife

Sharptail grouse dancing ground surveys revealed that 18 of 26 known grounds were active this year and two new grounds were located. The number of displaying males increased dramatically to 273, an increase of 64% from 1986.

Roadside crow counts are conducted annually to obtain population indices for ring-necked pheasants. Pheasant numbers were up during 1987, and this was reflected in a 25% increase from 1986 in the number of crows heard per stop. Pheasant production this year was judged to be better than 1986 and this improvement was evident during the hunting season (See H.8).

Gray partridge were common on the refuge this year. Adjacent landowners reported they had never seen so many huns. Coveys commonly contained 20 or more birds.

11. Fisheries Resources

Fishery management on the refuge is geared toward the establishment of a predator fish population, northern pike, that will help control or at least reduce the number of carp in refuge waters. A second objective is to establish a sizeable northern pike population that will provide sport fishing opportunities.

Successful stocking programs during the 1970's resulted in the establishment of a sizeable northern population. To gain additional understanding of the northern fishery a mark-recapture study was initiated in 1985 by Frank Pfeifer, USFWS, Valley City National Fish Hatchery. This study involved the trapping, tagging and release of 998 northerns. Through tag returns from additional fish trapping and returns by fishermen, important biological data such as population estimates, movements and growth estimates can be obtained.

Northern pike trapping during 13 & 15 April included 17 tagged fish. Data from this trapping revealed that females grew an average of 2.1 inches and gained 9 ounces during the period from April 1986 to April 1987. Males grew an average of 1.7 inches and gained 9 ounces during the same period.

During spring trapping 24 quarts of northern eggs and 10 quarts of walleye eggs were taken by fisheries biologists and transported to Garrison NFH, North Dakota. An additional 20 quarts of northern and 20 quarts of walleye eggs were taken to the state fish hatchery in Lewistown, Montana.

Additional trapping included gill netting efforts on the refuge 11 through 13 August. Walleyes dominated the catch; 71% by both number and weight. They were fairly uniform in size, averaging three pounds, and no doubt were the results of a 1982 stocking of 90,000 fingerlings. Stomach analysis was conducted on 29 northerns. Forty-eight percent were empty, 31% contained minnows and 21% contained carp. An examination of the fish that contained minnows reveal that 40% of these fish had carp remains. This information and the low catch rate for carp in gill nets indicate that the northern population is suppressing

the carp population to some degree.

Figure 14. Growth data being collected on a northern pike. ML-87-17. exp 16. 4/13/87. SM

A major obstacle in fishery management on the refuge is over-winter survival. The lake has experienced periodic major winter dieoffs presumably due to low dissolved oxygen (DO) levels. DO sampling is conducted monthly during the winter on major water impoundments important to fish populations. DO levels on Medicine Lake reached a low of 3.0 ppm during late January and early February but increased to 10 ppm in March. These levels were adequate to carry over fish until ice breakup in March and no evidence of winterkill was noted. DO levels in December were at 10 ppm, a good level to start the winter.

12. Wildlife Propagation and Stocking

A total of 235,540 northern pike were planted in Medicine Lake during 1987. Valley City National Fish Hatchery (NFH), North Dakota, delivered and released 86,000 (101 pounds, 800/lb.) fingerlings on 18 May at the gravel pit. Garrison NFH, Garrison, North Dakota, released 89,540 (110 pounds, 814/lb.) and 60,000 (108 pounds, 555/lb.) fingerlings near headquarters on 27 May and 2 June respectively. These fish represent the only northern pike stocking of Medicine Lake since 1984.

14. Scientific Collections

Dr. Robert Eng, Montana State University, trapped and removed 74 hatching-year lesser scaup, for release at Canyon Ferry Reservoir near Helena, Montana. The flightless scaup were captured in August with the use of drivetraps, banded and transported 500 miles for release. The objective of this project was to release young birds that would return as nesting adults to the release site in subsequent years.

15. Animal Control

The refuge predator management plan was drafted in the spring of 1985. The plan calls for the removal of striped skunk, raccoon and red fox to increase waterfowl production by increasing nest success.

Predator removal activities were initiated on 13 April 1987 and continued through 17 June. Seasonal employees were assigned the task of placement, movement and monitoring of 43 cubby box traps. A total of 2200 trapnights resulted in the capture of only six skunk and two raccoon. An additional four raccoon, four fox, three skunk and two coyote were removed by the refuge permittee trapper.

The few predators taken in 1987 is believed due to low numbers of skunk and raccoon on and adjacent to the refuge. Skunk and raccoon numbers have steadily declined since 1985. This decline is evident when a comparison of the number of animals trapped per 100 trapnights is made for the years 1985 to 1987. During that period the number of skunks caught dropped from 2.7/100 nights to .3/100 for 1985 and 1987 respectively (Table 13). Raccoons also dropped during the period from 1.3 to .09/100. The decline of predator numbers during the last three years is believed due to disease outbreaks and the continued emphasis of trapping and removal of predators on the refuge. Trapping efforts should continue at levels equal to the 1987 effort.

Table 13. Force account predator removal and trapnights, number of skunk, raccoon and number/100 trapnights, Medicine Lake NWR, MT, 1985-87.

	Trapnights (TN)	Skunks(#/100TN)	Raccoons(#/100TN)
1985	1350	37(2.7)	10(1.3)
1986	4600	42(.9)	18(.4)
1987	2200	6(.3)	2(.09)

16. Marking and Banding

Pre-season mallard banding for Zone 21 (Western North and South Dakota and Montana) were 1000 birds for each sex and age class. Each refuge within the zone is requested to band as many as possible. Three salt plains traps (swim-in traps) were employed on various refuge sites from 31 July to 11 September. Species, age and sex and number of the banded birds is shown in Table 14.

Table 14. Duck species, age, sex and total number trapped at Medicine Lake NWR, during 1987.

Species	AHY-M	AHY-F	HY-M	HY-F	L-M	L-F	TOTAL
Mallard	259	201	77	42	2	0	581
N. Pintail	2	7	5	3	0	0	17
Black Duck	1	0	0	0	0	0	1
Redhead	13	16	1	8	4	1	43
Canvasback	2	2	0	2	0	0	6
TOTAL							648

Dr. Robert Eng, Montana State University, banded 74 lesser scaup (see G.14) during August.

17. Disease Prevention and Control

Avian botulism occurs annually on the refuge and losses in 1987 totaled 5778 birds, compared to 5064 in 1986. Species encountered during routine cleanup and patrol are shown in Table 15.

Table 15. Species and number of dead birds picked up during botulism outbreak, MLNWR, 1987.

Species	Number	Species	Number
Common Merganser	1	Western Grebe	39
Mallard	338	Eared Grebe	1
Gadwall	282	California Gull	10*
American Wigeon	62	Ring-billed Gull	3*
Green-winged Teal	2661	Franklin's Gull	24
Blue-winged Teal	308	Common Tern	3*
Northern Shoveler	270	DC Cormorant	21*
Wood Duck	1	White Pelican	23*
Redhead	28	American Bittern	2
Canvasback	1	Great Blue Heron	1*
Lesser Scaup	21	American Avocet	21
Ruddy Duck	17	Ringnecked Pheasant	7
Unidentified Duck	336	Western Meadowlark	1
Unidentified Duckling	250	UID Shorebird	322
Canada Goose	4	UID Bird	61
American Coot	487		
TOTAL WATERFOWL	**5226**	**TOTAL NONWATERFOWL**	**552**

TOTAL BIRDS 5778

*Colonial bird totals may include non-botulism killed birds.

Botulism losses first occurred on 24 June with two suspected botulism-killed ducks and continued until 18 September. Daily losses peaked during the week of 9 August with 2186 birds picked up during a five-day period.

The Homestead Unit of the refuge experienced the greatest loss with 5012 birds picked up. Poor water conditions, lack of fresh water, and the inability to adequately drain portions of the marsh contributed to the high losses. High August temperatures, algae blooms and other organic decomposition resulting in anaerobic conditions are the suspected agents in the botulism outbreak. Future plans to develop the Homestead Unit including a crossdike and new high capacity outlet water control structure will allow the refuge greater management flexibility in dealing with botulism.

Epizootic Hemorrhagic Disease (EHD) was diagnosed in white-tailed deer by Montana Department of Fish, Wildlife and Parks biologist throughout central and eastern Montana during 1987. EHD is a viral disease that is transmitted by biting gnats known as Culcoides variipennis. Other biting insects may also transmit the disease which affects both species of deer but is

apparently more severe in white-tailed deer. Over 90% of the white-tails that acquire the disease will eventually die. EHD affects the blood clotting response in the infected animal resulting in massive hemorrhaging and death in eight to 36 hours from the onset of clinical symptoms (Figure 15). EHD typically occurs in late summer and early fall and terminates when the first hard frost destroys the biting insects that transmit the disease.

Figure 15. White-tailed buck killed by epizootic hemorrhagic disease. Note the result of extensive hemorrhaging. MD-87-13, exp 20. 10/17/87. SM

Medicine Lake refuge lost deer to EHD but the extent and total numbers lost are not known. Aerial surveys conducted by the Montana Department of Fish, Wildlife and Parks on 11 October revealed 17 dead white-tails on the refuge and 56 dead deer adjacent to the refuge on private land. EHD apparently first occurred during the week of 30 August. The first suspected case on the refuge occurred on or about 11 September when the fresh carcass of an adult doe was found in bulrush along Homestead Lake. Refuge personnel found an additional eight deer that were suspected EHD mortalities. The extent of the losses will not be known until the mid-winter surveys are flown by the Fish, Wildlife and Parks in early 1988. State officials presently estimate that the white-tailed deer herd on and adjacent to the refuge may have experienced a 20% mortality due to EHD. Refuge personnel believe that mortalities may exceed 40% for the refuge.

H. PUBLIC USE

1. General

Public use visits totaled 3435 in 1987, compared with 4415 in 1986. Hunting and fishing accounted for 65% of the total visits.

5. Interpretive Tour Routes

Fifteen guided tours were given to school groups, 4H and scout troops during the year. A total of 323 people attended these tours.

6. Interpretive Exhibits/Demonstrations

Two informational kiosks were constructed and placed at refuge headquarters and the north entrance to the public hunting area. These kiosks were modeled after those designed by J. Clark Salyer NWR, North Dakota, and utilize removable panels that highlight specific refuge wildlife or programs (Figure 16). Panel topics developed this year include white-tailed deer, northern pike, shore and marshbirds and a childrens' animated wildlife quiz.

8. Hunting

Pheasant hunters harvested 160 birds on opening day on the refuge. A total of 77 hunters (58 nonresidents, 19 residents) reported hunting 360 hours resulting in 2.08 birds/hunter. Totals for 1986 included 162 birds, 117 hunters and 1.38 birds/hunter.

White-tailed deer hunters experienced poor success on the refuge with only 11 deer checked opening day. Success throughout the season was judged poor, probably a result of the EHD outbreak (See G.17).

Waterfowl hunting was judged poor again in 1987. Interest in duck hunting by local residents continues to be low and most duck hunters are non-residents who hunt ducks in conjunction with upland bird hunting.

Figure 16. New kiosk along auto tour route and entrance to public hunting area. ML-88-01, exp #14. 1/88. SM

9. Fishing

Northern pike fisherman experienced good luck during January and February (Figure 17). Spearing was the most common fishing method with as many as 40 ice houses on Medicine Lake. Spearing was also good during November and December; the largest fish taken was 18 pounds. Fifty ice houses were counted on the main lake during December.

Figure 17. Beauty and the beast! ML-88-01, exp #7. 12/87. SM

The summer fishing season was highlighted by the Second Annual Medicine Lake Fishing Derby sponsored by the Medicine Lake Town and Country Club. A total of 60 fisherman entered the June contest resulting in 12 fish caught, the largest a seven pound northern.

10. Trapping

A new public trapping program was initiated on the refuge in 1986. The program established six trapping units and required a $50 permit fee with a rebate of $3 for each striped skunk and raccoon trapped, which is applied back to the permit fee (not to exceed $50). Each trapper is allowed unlimited numbers of badger, coyote, mink, muskrat, raccoon, red fox and striped skunk. Beaver quotas are established for each unit and numbers taken are based on tree damage and nuisance related to plugged culverts and water control structures. Interest in this

program continues to be low with only two individuals expressing interest in trapping the refuge. One individual trapped three units during the fall of 1987 and reported taking one badger, five coyote, one mink, 80 muskrat, two raccoon, three red fox and three striped skunk. A second trapper trapped three units and reported taking 11 coyote, four red fox, two badger and two striped skunk.

11. Wildlife Observations

The refuge has two observation blinds that are placed near sharptailed grouse dancing grounds during spring courtship. Newspaper announcements of this opportunity to observe sharptails generated two requests for use of the blinds.

14. Picnicing

An estimated 100 visitors used the refuge picnic area located on Medicine Lake.

16. Other Non-Wildlife Oriented Recreation

The town of Medicine Lake hosted the Northeast Montana Team Triathalon during June. The event included a 40K bike race from the town of Medicine Lake to Froid, Montana, and return to Medicine Lake Refuge. The second leg was a 10K canoe race from the west shore of Medicine Lake to the north shore. The contestants then ran 10K from the refuge back to the town of Medicine Lake. Ten teams (three persons on each team) entered the competition that was held in conjunction with the Medicine Lake Fishing Derby (Section H.8).

I. EQUIPMENT AND FACILITIES

1. New Construction

Water control structure 9F (west end of Long Lake) was replaced with the new improved version at a cost of $40,750 including two fish screens at $7000 each (Figure 18 & 19).

2. Rehabilitation

Cedar shakes/shingles replaced slate shingles on the office building, the "barn" (student quarters), and Quarters #1 (Figure 20).

The road was raised and culverts installed in four low areas along the Lake Grade Flats road (Fig 21).

A solar panel was installed on the west side of Quarters #2.

A Hydro-Pulse propane furnace replaced the oil burner in the

office building. We are hoping for a more efficient heating system.

Figure 18. Old 9F structure during removal. ML-87-12, exp #10. 9/14/87. TF

Figure 19. The new and improved. ML-87-18, exp #17. 11/15/87. GS

Figure 20. Off with the old, on with the new. ML-87-15, exp #14, 8/87. SM

Figure 21. Lake Grade Flats road. ML-87-18, exp #26. 1/20/88. TF

4. Equipment Utilization and Replacement

New equipment include a Dodge 1/2 ton 4X4 pickup, a Honda 250cc 4-wheeler, and a 200 gallon pumper unit.

Devils Lake WMD transferred a Model 12 Caterpillar grader. It was put to immediate use.

6. Computer System

We received a Zenith 286 computer (40 MB), a C.Itoh CM4000 color EGA monitor, a Fujitsu DL2400 (dot matrix) printer and a US Robotics 2400 modem.

7. Energy Conservation

The Hydro-Pulse propane furnace replaced the oil-fired furnace to reduce our consumption of carbon fuels. It was installed in mid-December so we have no comparison for 1987.

J. OTHER ITEMS

1. Cooperative Programs

A wetland development project in cooperation with Duck's Unlimited was initiated in November, 1986. The area, Lake Creek Flats, is a sub-irrigated wetland meadow with old meandering oxbows that provide water areas only during years of above average precipitation. The project opened up mesic areas and provide open water areas for breeding duck pairs and islands for nesting (Fig 22). Broodponds are six islands in a checkerboard arrangement with motes of water surrounding each island. Each broodpond is approximately 300 X 400 feet. Ten dugouts were constructed, each 165' X 65' X 6' deep. There are 30 blasted potholes.

We proposed replacement of Indian Service Dam (Fig 23), cross-diking, and two control structures in the Knutson Bay area of the Homestead Unit to DU. The diking and control structures are planned to be built in 1989. Replacement of Indian Service Dam may take place in 1990.

Figure 22. Lake Grade Flats DU project, E to W. ML-87-3, exp #5, 3/87. GS

Figure 23. You start to deteriorate after you've been around for over 50 years. ML-87-12, exp #12. 9/16/87. TF

2. Other Economic Use

During 1986 two oil wells north of #11 Lake were put into production using submersible pumps. Both wells developed submersible pump failures due to the shallow depth of the wells, high salt concentrations, large volumes of natural gas, and not enough downhole fluids. Hunt Energy was allowed to change from submersible pumps (Fig 24) to conventional pumping units. The changeover took place in January and these "grasshoppers" seem to have solved Hunt's problems, but we now look at a cluttered landscape (Fig 25).

Figure 24. 1986 view of oil well I-13 to SW. GS

Figure 25. 1987 view of oil well I-13 to SW. ML-88-01, exp 18, 1/88. SM

4. Credits

Brock wrote the introduction. Martin authored Sections G and H with Ensign providing data analysis and some text for G-3. Fuller is responsible for the remainder of the text. Stroops edited and Quarne typed and arranged the report. Photographers are Fuller - TF, Martin - SM, Stroops - GS, Ensign - JE.

K. FEEDBACK

LAMESTEER NATIONAL WILDLIFE REFUGE

Wibaux, Montana

The 800 acre easement refuge is 20 miles southeast of Wibaux, 160 miles south of MLNWR. The Service has no control of upland, only water and hunting rights.

Pumping for irrigation from the reservoir is allowed when surplus water is available.

Since enforcement of hunting right regulations was impractical, the refuge was opened to hunting in 1981. The neighbors control access.

The Service reapplied for water rights in 1985. The water right was decreed for 647 acre feet on 11 February 1987.

Fuller inspected the refuge 8 May. The reservoir was at capacity with the gage reading at 98.76. No sign of cattle was present. Photographs were taken to duplicate the 1984 fall pictures. The signs our neighbors were using to post their land were removed.

At least three breeding pairs of Canada geese were observed. No broods were observed.

Public use included firewood along the shoreline and fishing jugs in the water.

INTRODUCTION

NORTHEAST MONTANA WETLAND MANAGEMENT DISTRICT

The Northeast Montana Wetland Management District (NEMTWMD) is located in the extreme northeastern corner of Montana. It is bounded on the north by Canada, on the east by North Dakota, on the west by the Fort Peck Indian Reservation and on the south by the Missouri River. The district is located in Sheridan, Roosevelt and Daniels counties.

This tri-county management district was entirely glaciated and could be considered a continuation of the prairie pothole region of the Dakota's. The northern portions of Sheridan and Daniels counties have terrain common to the glacial Missouri coteau, with very hilly landscape, dotted with many shallow depressions.

Native vegetation is of the mixed grass prairie type. This district lies in the transition zone between the tall grass prairies to the east and the short grass prairie of central Montana. Cool season grasses predominate with scattered shrub communities. Trees exist only in planted shelterbelts.

The climate is typical of the northern Great Plains, with warm summers, cold winters and marked variation in seasonal precipitation. Precipitation averages 12 to 15 inches per year. Temperatures can exceed 100 degrees in the summer and drop to -45 degrees in the winter. Spring is generally quite windy with velocities of 20 miles per hour occurring about 15 percent of the time. Winds may occasionally exceed 50 miles per hour with passing weather systems.

The Wetland Management District is responsible for the management of 41 separate waterfowl production areas (WPA's) totaling 9,165 acres. These WPA's vary in size from four acres to 1,657 acres. An additional 7,674 acres of privately owned wetland acres are protected from drainage, burning and filling by perpetual wetland easements. Acquisition first started in 1969, and though it has slowed down in the early 1980's, easement and fee title tracts are still being acquired.

Some of the 41 separate WPA's are adjacent to larger meandered (state owned) lakes which are not included in this figure. The WPA's contain 2,625 acres of native grassland, 2,052 acres of dense nesting cover and 1,113 acres of introduced grasslands. There are 331 acres of cropland which are cooperatively farmed primarily to reduce waterfowl depredations on adjacent private lands.

This wetland district lies within the Williston Oil Basin, which was one of the most active oil basins in the lower 48

states. Oil exploration and development is widespread throughout the area. The majority of WPA tracts were acquired without the underground mineral rights. This resulted in reservations for development of the subsurface right by the owner or their assigned third party. For this reason, seismic oil exploration and well development is common on these WPA tracts.

INTRODUCTION

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G. WILDLIFE

H. PUBLIC USE

I. EQUIPMENT AND FACILITIES

J. OTHER ITEMS

A. HIGHLIGHTS

Piping plover surveys located record numbers of plovers and nests in the district (Section G.2).

Waterfowl production estimates employed a new concept, "Four Square Mile" (Section G.3).

B. CLIMATIC CONDITIONS

Refer to the Medicine Lake NWR report. The weather station in Westby, Montana, which would provide data for many of the WPA's, was inactive during 1987.

C. LAND ACQUISITION

1. Fee Title

International Marsh WPA

Rich Johnson (realtor from CMR) and Fuller met with the Daniels County Commissioners concerning acquisition needed before the Duck's Unlimited project could be started. DU will build a dike with control structure which would back water beyond the existing WPA boundary. The FWS will either purchase these additional acres in fee title or take a flowage easement. The commissioners accepted both forms of acquisition. All landowners involved on the US side are agreeable to the project, but we are having title and other legal problems. Landowners on the Canadian side are not so agreeable, and the project is on hold until these landowners will accept reasonable payment.

Tufton Acquisition

The RO approved acquisition of 640 acres in northern Sheridan County. At the last minute the landowner sold to his neighbor. We lost some excellent waterfowl habitat.

Table 1. Fee acres by county as of 12/31/87, NEMTWMD.

County	Number Tracts	Number WPA's	Total Acres
Daniels	5	3	646
Roosevelt	2	1	179
Sheridan	68	37	8,340
Totals	75	41	9,165

2. Easements

Inactive during 1987.

Table 2. Easement acres by county as of 12/31/87, NEMTWMD.

County	Number Easements	Wetland Acres
Daniels	6	262
Roosevelt	10	1007
Sheridan	107	6405
Totals	123	7674

E. ADMINISTRATION

Operational funding and personnel are incorporated with the Medicine Lake NWR report. No separate program is work-planned for the WMD.

7. Technical Assistance

Fuller and the Sheridan County SCS soil scientist inspected Waterbank areas with contracts expiring as of 12/31/86. USDA did not have enough funds for renewing all eleven contracts. I ranked these eleven Waterbank areas based on potential for waterfowl habitat and the soil scientist was to rank them based on the areas soils. He got involved with the CRP program and the Sheridan County ASCS used my rankings. The ASCS committee partially funded only two of these contracts. All the remaining areas were hayed and fortunately none were tilled.

F. HABITAT MANAGEMENT

1. General

Table 3 summarizes habitats managed. These acres include BLM and Montana state school lands.

Table 3. Habitat types as of 12/31/87, NEMTWMD.

	COUNTIES			
	Acres			
Habitat Type	Daniels	Roosevelt	Sheridan	Total
Wetlands (1)				
Type 3	3	6	316	325
Type 4	161		473	634
Type 5			1040	1040
Type 6		160	875	1035
Streams			6	6
Subtotal				3040
Upland				
Native prairie	379	123	2315	2817
Est. prairie			30	30
Prairie brush	12	6	287	305
DNC	62	47	2487	2596
Tame	26		1018	1044
Subtotal				6792
Shelterbelt			9	9
Roads			31	31
Trails	2		11	13
Oil well sites			2	2
Building site			2	2
Totals	645	342	8902	9889

(1) Based on Stewart & Kantrud, 1971.

2. Wetlands

The only run-off the WMD had was in a narrow band along the Canadian border. This area received about five inches of rain on 30 July. This precipitation only affected a few WPA's and I'm not sure if it is wanted (Fig 1).

Figure 1. Northeast corner of Jagiello WPA. ML-87-10, exp #8. 8/6/87. TF

All type 1-3 wetlands in the WMD are dry and most type 4's and 5's are dry.

4. Croplands

The large, round bales of winter wheat from our share on the refuge were placed on the following WPA's; Big Slough - 3 bales, Erickson, Basecamp, and Gjesdal West - 2 bales, and Goose Lake - 1 bale.

Redhead Retreat WPA

In 1985, 18 acres were seeded to DNC. This unsuccessful seeding was reseeded 23 April using 9# PLS intermediate wheatgrass and 2# bulk alfalfa. We attempted to burn the dead kochia and sweetclover but there wasn't enough fuel to carry a fire. The Lilliston no-till drills were used for this WPA and all 1987 seedings.

Goose Lake WPA

We interseeded 115 acres to DNC (9# intermediate wheatgrass, 1.7# alfalfa, and 0.8# sweetclover PLS) during the last week of April. These areas were seeded in 1985 but were poor stands. The areas were not tilled prior to seeding.

We interseeded 115 acres to DNC (9# intermediate wheatgrass, 1.7# alfalfa, and 0.8# sweetclover PLS) during the last week of April. These areas were seeded in 1985 but were poor stands. The areas were not tilled prior to seeding.
During the latter part of June, 112 acres of monotypic smooth brome were disced once, then spiked in preparation for a 1988 DNC seeding.

State Line WPA

Thirty-four acres of monotypic smooth brome were disced twice prior to seeding with DNC the 28th of August. The mixture contained 4#s each of tall and intermediate wheatgrass, 2# alfalfa, and 1/2# sweetclover, all PLS.

Big Slough WPA

One hundred sixteen (116) acres of unsuccessful 1985 DNC seedings were disced in June and seeded to DNC the 28th of August. The mixture included 5#s each of tall and intermediate wheatgrass and 2# of alfalfa, PLS.

The 1986 seedings look poor, but we will give them another year before a determination is made whether they have to be reseeded.

The 1987 spring seeded areas were successful as to germination, but whether they can compete with kochia and Russian thistle is doubtful. The August seedings do not appear to have germinated.

8. Haying

We released 121 acres of crested wheatgrass for hay on Erickson WPA. The fields were cut in mid-June. Our nest search data indicate very low nesting density in poor stands of crested. The cooperator's yield was one large, round bale/acre. I required the hayed fields to be spiked as payment. We disced these fields once in August and plan to seed DNC next year.

9. Fire Management

The unsuccessful attempt to burn Redhead Retreat's DNC seedings was mentioned under croplands. We also tried to burn Rivers WPA with the same intent, but again there wasn't enough fuel to carry a fire.

10. Pest Control

Approximately 30 acres of Canada thistle was sprayed with 2,4-D Amine on Flaxville WPA.

13. WPA Easement Monitoring

Being an old Dakota Territory easement worker, I was saddened by the fact that there wasn't a single easement violation.

Two stock watering dugouts were permitted on Sheridan County, easement 16x.

On Sheridan County easement 131x-1, the landowner was allowed to fill in an old pit to the natural elevation of the wetland. He was allowed to use only the fill removed when the pit was constructed.

G. WILDLIFE

1. Wildlife Diversity

Habitat diversity is an integral part of wildlife diversity within the Wetland District. The juxtaposition of wetlands, uplands and agricultural fields provide habitats for various resident and migrant birds as well as numerous mammalian species.

2. Endangered and/or Threatened Species

Whooping cranes, bald eagles and peregrine falcons have been observed in migration in the past on the district but none were sighted this year.

Piping plovers, a threatened species in Montana, were first discovered nesting on the district in 1986. Search efforts were expanded in 1987 in an attempt to locate additional birds and to determine the presence or absence of nesting on WPA's. Plover surveys were initiated during May and continued into late June and early July. Eighteen WPA's were searched with a total of 45 miles of shoreline examined. During these searches a total of 17 adults were found on seven different WPA's including Wigeon Slough, Big Slough, Espin, Dog Leg, Ferguson, Parry and Goose Lake.

Dog Leg WPA, the only known nest site in 1986, was first visited on 15 May. A pair of adult plovers were sighted in territorial defense of the sandy point along the southeastern shore where nesting occurred last year. The area was revisited on 3 June but neither bird exhibited nesting or territorial behavior. On 19 June, the site was revisited and a nest (NEM87-01) with the remains of three eggs was found. The nest was believed to have been destroyed by a fox that was denning within 300 yards of the nest. No other nesting attempts were documented on Dog Leg during 1987.

The only other WPA where known nesting occurred in 1987 was on Big Slough. A nest (NEM87-03) with four eggs was found on 29 June along the south shore. A revisit to this nest on 2 July revealed two young plovers and a single unhatched egg in the nest bowl. A second nest (NEM87-04) was discovered along the north end of the lake. This site contained three adults and an apparent nest scrape on 29 June. This second nest contained four eggs and was known to have successfully hatched four young when revisited on 20 July.

Plover surveys were also conducted on ten private wetlands beaches totaling 28 miles. Twenty-four adults were found including 18 individuals on one alkali lake shore. Nesting was known to have occurred on two areas although nests were not discovered. Areas where young (NEM87-05) were observed include a small unnamed lake southwest of Westby, Montana, where two young were seen and a single young (NEM87-02) on Salt Lake, located along the Canadian border.

When completed 28 areas totaling 74 miles of shoreline had been searched during 110 man-hrs. Forty-two adults, nine young and five nesting attempts were documented (Table 4).

Table 4. Piping plover nests, location, number of eggs, fate and number of young observed, NEMWMD, 1987.

NEST	LOCATION	NO EGGS	FATE	NO YOUNG
NEM87-01	NEMWMD:T37N,R58E SE1/4, S 20	3	U	0
NEM87-02	NEMWMD:T37N,R56E NE1/4, S 2	?	S	1
NEM87-03	NEMWMD:T34N,R58E NW1/4, S 11	4	S	2
NEM87-04	NEMWMD:T34N,R58E NW1/4, S 2	4	S	4
NEM87-05	NEMWMD:T36N,R58E NE1/4, S 25	?	S	2
	TOTAL	11	4 S 1 U	9

S Successful nest
U Unsuccessful nest
? Nest not located

3. Waterfowl

Water conditions improved slightly during 1987 and probably accounted for the increase in the estimate of number of breeding pairs. Breeding pairs increased for both dabblers and divers from 285 pairs in 1986 to 600 pairs.

Duck production estimates were obtained from data collected during a predator control study (G.11). Methods used to arrive at production estimates were similar to those used for refuge production (See Refuge G.3). Production estimates are shown below.

Gadwall	540	
Blue-winged teal	100	
Northern shoveler	190	
Mallard	125	
Northern pintail	55	
American wigeon	50	- Best guess estimate
Lesser scaup	120	- Best guess estimate
Redhead	50	- Best guess estimate
Ruddy duck	75	- Best guess estimate
Canvasback	30	- Best guess estimate
TOTAL	**1335**	

Additional estimates of duck production were obtained from a Northern Prairie Wildlife Research Center. This study dealt with developing a system for assessing status and trends in waterfowl breeding populations and production on USFWS and surrounding lands in the Prairie Pothole Region. The study, also known as the Four Square Mile Production Estimate Technique, was initiated with a pilot study on Wetland Management Districts (WMD's) in eastern North Dakota and western Minnesota in 1986 and expanded to other stations throughout the prairie pothole region.

The study requires the counting of breeding duck pairs on all wetlands, regardless of land ownership, within randomly selected four square mile blocks. In addition the entire WMD is flown and photographed with VCR cameras to determine the number of "wet" wetland basins. The number of pairs observed are then expanded to include all wetlands throughout the district by using wetland indices resulting in an estimate of the total number of pairs. Production estimates are then derived from a deterministic model developed by NPWRC. The heart of the model revolves around species nesting preference for habitat types and nesting success by habitat for the five species.

When completed the Four Square Mile method estimates duck production for mallard, pintail, gadwall, blue-winged teal and northern shoveler. Production is also provided for the five species in three ownership categories; easement, federal and private.

Breeding pair counts in the WMD were initiated and completed in May. A minimum of 150 wetland basins were examined, the pairs counted and the resultant data provided to NPWRC. NPWRC duck production estimates for the five species throughout the WMD is shown in Table 5.

Table 5. Ownership, number of pairs, recruits and recruits/area for Four Square Mile Breeding Pair Counts, NEMWMD, 1987.

Ownership	Pairs	Recruits	Recruits/area(Sq.mi.)
Easement	9,166	10,920	81.97
Federal	5,733	8,942	140.89
Private	114,362	159,749	29.99
TOTAL	129,260	179,612	32.52

Pair estimates and number of recruits (number of ducklings produced) include the area of Medicine Lake Refuge. Unfortunately the data are lumped for the WMD and the refuge under the ownership class of federal land precluding an accurate evaluation of NPWRC estimates with those projected by the refuge and wetland staff. A comparison of the estimates of duck production by the refuge and NPWRC are shown in Table 6.

Table 6. Combined number of duck pairs and production estimates for MLNWR and NWMWMD using refuge and NPWRC methodology.

	No. Pairs	Production
Refuge estimate	6775	17,575
NPWRC estimate	5733	8,944

The disparity in the above estimates of the number of pairs can partially be explained by the sampling procedure used by NPWRC which included the sampling of one plot on Medicine Lake. This large body of water would bias the number of pairs downward according to the NPWRC staff. Sampling on refuges with large bodies of water will require more sampling of smaller blocks than four square miles.

Production estimates differences between the two methods is more alarming and warrants closer examination. A portion of this difference is related to the nesting success data used by NPWRC. Mayfield Success used by NPWRC averaged 30%. Nesting

success determined for MLNWR for the 1987 season ranged between 57% and 72%. Other differences are probably related to the methods used by the refuge to calculate nesting densities and success.

Canada goose production based on casual observation was estimated at 15 goslings. Artifical structures, placed during 1986, on seven WPA's experienced low use. Fourteen structures examined after the nesting season revealed no goose use and one structure contained a successful mallard nest.

4. Marsh and Waterbirds

Common nesters on the district include eared, horned and western grebe, American bittern, black-crowned night heron and sora and Virginia rail. Sandhill cranes were observed during fall migration on several occasions.

5. Shorebirds, Gulls, Terns and Allied Species

Known nesters include American avocet, marbled godwit, upland plover, western willet, common snipe, killdeer and black tern. Additional species present during migration include long-billed dowitcher, greater and lesser yellowlegs, Wilson's phalarope, and various sandpipers.

6. Raptors

Swainson's hawk, ferruginous hawk, northern harrier, and short-eared, great horned and burrowing owls are known to nest in the area. Golden eagles, prairie falcons are sighted occasionally during the year and during migration merlin, American kestrel, gyrfalcon, rough-legged hawks, accipiter spp. and snowy owl may be sighted.

A spring raptor survey, in cooperation with the Montana Dept. of Fish, Wildlife and Parks, was conducted on 27 May along a 60 miles auto route through the district. A total of 14 raptors were sighted including six Swainson's and two ferruginous hawks, three harriers and three burrowing owls.

7. Migratory Birds

Mourning doves nest on several WPA's but seem limited to those areas that contain trees for nesting. The extent of ground nesting in not known and total production for the year was estimated at 75.

8. Game Mammals

Three to four hundred deer were believed present on the district prior to the outbreak of EHD (See G.8 Refuge Narrative). Private landowners reported several suspected EHD mortalities adjacent to one WPA.

10. Other Resident Wildlife

Sharp-tailed grouse, ringed necked pheasants, and gray partridge are present throughout the district but census data are not collected.

15. Animal Control

A predator control study was initiated in 1986 to study the affect of kill-trapping mammalian predators to increase duck nesting success. Nesting successes are determined by nesting studies that employ searches with cable chain drags. The study involves Goose Lake, Big Slough and Erickson WPA's. Goose Lake and Big Slough have fields that are trapped and fields that are not trapped. Erickson is not trapped and serves as a control. All study area fields (N=9) trapped or nontrapped were searched twice for duck nests.

Predator control efforts were initiated 27 April and concluded 15 June. A total of 1200 trap-nights were recorded with 13 traps on Goose Lake and eight on Big Slough.

Nest searches were initiated 19 May and were concluded by 24 June. A total of 61 duck nests were located including 33 gadwall, 12 northern shoveler, eight blue-winged teal, five northern pintail, two lesser scaup and one mallard.

The number of predators trapped were considerably less than the number taken in 1986. Three skunks were removed from Goose Lake and Big Slough compared to 19 skunks and five raccoons removed in 1986. A comparison of trapping results for 1986 and 1987 reveal that the number of animals caught/100 trapnights dropped from 1.7 to .25. These data suggest that trapped areas in 1987 had fewer skunks and raccoons than in 1986.

If skunks and raccoons are responsible for depredations on nesting waterfowl, then a large reduction in their numbers should be reflected in an increase in duck nesting success. Apparently this phenomena is occurring in the Wetland District.

Small sample sizes, for areas searched and number of nests found, preclude any high degree of statistical confidence on nesting success data. Nesting success is expressed as apparent success (no.nest hatched/no.nests). Small sample sizes also necessitated the lumping of data into trapped and nontrapped

areas. Therefore, Goose Lake and Big Slough are lumped together as the trapped areas and Erickson is the nontrapped area. Table 7 tabulates the results for 1986 and 1987.

Table 7. Number of duck nests, apparent success (AS), and number of predators trapped and number of predators caught/100 trapnights, NEMWMD, 1986-87.

	1986			1987		
	Nests	AS	No. Trapped	Nests	AS	No. Trapped
Goose Lake & Big Slough	32	50%	24	38	61%	3
Erickson	11	90%	0	23	65%	0
Total	43	60%	0	61	62%	0
Predator caught/ 100 trapnights		1.7	24		.25	3

These data reveal that hatching success on trapped WPA's increased from 50 to 61% from 1986 to 1987. This increase in hatching success is attributed to lower numbers of predators on Goose Lake and Big Slough WPA's during 1987; 24 were removed in 1986. This evaluation is supported by the relative abundance indice of animals caught/100 trapnights which dropped from 1.7 to .25 for 1986 and 1987 respectively. The control area, Erickson, experienced a reduction in nest success from 90% to 65% for the same period. The number of predators on Erickson may have increased between the years but data to support this doesn't exist since the relative abundance of predators is based on the number of animals caught, ie. Erickson is nontrapped.

The study is scheduled for completion in 1988 at which time an analysis of the three years of data will be made and a final report written. At the present time we've learned two important things about predator control to increase waterfowl nesting success on WPA's. One, a reduction in predator numbers can lead to an increase in duck nesting success, a fact that has been demonstrated by numerous predator/nesting research studies conducted throughout the prairie potholes. Two, control efforts should also be limited to areas that are most attractive to nesting waterfowl and where predators are having a significant impact on nesting waterfowl. Widespread predator control throughout the district is probably not cost effective or biologically warranted but control of some degree should be a management tool option that is available to waterfowl managers.

H. PUBLIC USE

1. General

Public use in the Wetland District is considered light and is limited almost exclusively to hunting. Visits to the district were estimated at 350.

8. Hunting

White-tailed deer are the most commonly hunted species. Goose Lake and Erickson WPA's contain extensive DNC plantings and consequently contain the largest deer herds. Hunting pressure was considered light again this year with most hunting occurring on opening day.

Opportunities for bird hunting are good throughout the district but few hunters take advantage of the waterfowl or grouse seasons. Few WPA's receive more than an occasional hunter.

17. Law Enforcement

Approximately one acre of farm trespass on Jageillo WPA was solved by contacting the neighbor.

I. EQUIPMENT AND FACILITIES

2. Rehabilitation

A Special Use Permit was issued to allow a cattle water access lane along the south boundary of Pintail Marsh WPA. The landowner is responsible for all maintenance of this lane with the FWS providing the materials.

Because most wetlands are dry, this fall we fenced areas where cattle had access to the WPA's. Most corners were built with an eight foot galvanized pipe driven into the marsh, then a woven wire basket was filled with rock (Fig 2).

Figure 2. Rock basket corner on Pintail Marsh WPA. ML-87-18, exp #23. 1/7/88. TF

Areas fenced were:

WPA	Rods	WPA	Rods
Big Slough	95	Espen	20
Pintail Marsh	205	Chandler	30
Redhead Retreat	30	Basecamp	20
Westgard	30	Wigeon Slough	50
Gjesdal East	70		

8. Other

The granary on Hansen WPA was burned in March when we finally had enough snow for a safe burn.

Figure 3. No one needed the wood for picture frames, so ... ML-87-2, exp #31. 3/19/87. TF

Figure 4. We burned it! ML-87-2, exp #36. 3/19/87. TF

J. OTHER ITEMS

2. Other Economic Uses

Beehives were allowed on Erickson, Basecamp, Goose Lake, and Big Slough WPA's.

4. Credits

Brock wrote the introduction. Martin authored Sections G and H with Ensign providing data analysis and some text. Fuller is responsible for the remainder of the text. Stroops edited and Quarne typed and arranged the report. Photographers are Fuller -TF, Martin - SM, Stroops - GS, and Ensign - JE.